The number in ( ) shows how many points the question is worth. If a multi-part question, the points are distributed across the questions.

(4) 1. What’s the difference between inverse and direct proportions? What does the graph of each look like?

(2) 2. Write 3600 in scientific notation. How many significant figures are there?

(2) 3. Write $6.003 \times 10^{-1}$ in decimal notation? How many significant figures are there?

(2) 4. Identify the following as scalar or vector.
   A. 10 m/h North
   B. 15 lbs.

(4) 5. What’s the result of traveling 78.3 miles West and 15.2 North?

(2) 6. If you are rowing along at 15 miles per hour in your boat in still water, what would your velocity be if you continued in a current moving in the same direction as you at 5 miles per hour?

(4) 7. You drive south for 35 minutes at 85 km/hr and then stop for 15 minutes. You then continue south, traveling 130 km in 2 hr.

   A. What is his total displacement?
   B. What is his average velocity?

(4) 8. A car starts from rest and travels for 5.0 s with a uniform acceleration of $+1.5 \, \text{m/s}^2$. The driver then applies the brakes, causing a uniform acceleration of $-2.0 \, \text{m/s}^2$. If the brakes are applied for 3.0 s

   A. How fast is the car going at the end of the braking period?
   B. How far has it gone?

(2) 9. Suppose that two objects attract each other with a force of 16 units. If the distance between the two objects is doubled, what is the new force of attraction between the two objects?

(6) 10. A boat moves through the water with 2 forces acting on it. One is a 2000 N forward push by the water on the propeller and the other is an 1800 N resistive force due to the water around the bow.

   A. What is the acceleration of the 1000 kg boat?
   B. If it starts from rest, how far will it move in 10.0 s?
   C. What will its velocity be at the end of this time?
(2) 11. A cord which goes vertically to a pulley is hooked to a 2 kg mass that rests on the floor. A second mass is attached to the other end of the cord and released. If the 2 kg mass rises 25 cm in 1/3 s, what is the mass of the weight?

(2) 12. A 2 kg block has an initial velocity of 5.00 m/s as it starts sliding up a 30º inclined plane. How far up the inclined plane does the block slide before it stops?

(2) 13. A box of books with a total mass of 50 kg is initially at rest on a level floor. What is the weight of the box?

(2) 14. A crate with a total mass of 50 kg is initially at rest on a level floor. If the crate is being lifted at a constant upward velocity of 2 m/s, what is the magnitude of the upward force acting on the crate?

(4) 15. A 1500 kg car moving at 100 km/h crosses the top of a hill with a radius of curvature of 90 m. What is the normal force exerted by the seat on the driver if the mass of the driver is 50 kg?

(4) 16. A car traveling at a maximum speed of 14 m/s can round a 70 m radius horizontal curve without slipping. How fast can the car round a 300 m radius curve on the same road?

(2) 17. If the pressure in an inflated ball is 171 Pa and its temperature is 293 K (diameter of ball = 30.0 cm), how many moles of air are in the ball?

(2) 18. A steel wire 4.5 m long stretches 0.15 cm when it is given a tension of 370 N. What is the diameter of the wire?

(2) 19. To make steam, you add 5.60 X 10^5 J of heat to 0.220 kg of water at an initial temperature of 50.0°C. What is the final temperature of the steam?

(2) 20. How much water (density = 1.00 X 10^3 kg/m^3) must be displaced to float a cubic block of wood (density 655 kg/m^3) that is 15.0 cm on a side?

(4) 21. One mole of an ideal gas initially at a temperature of T ≈ 0°C undergoes an expansion at a constant pressure of one atmosphere to four times its original volume.
   A. Calculate the new temperature T_f of the gas.
   B. Calculate the work done on the gas during the expansion.

(4) 22. A gas is compressed at a constant pressure of 0.800 atm from 9.00 L to 2.00 L. In the process, 400 J of energy leaves the gas by heat.
   A. What is the work done ON the gas?
   B. What is the change in its internal energy?
23. A tiny, 0.60 g ball carries a charge of magnitude 8 \mu C. It is suspended by a thread in a downward electric field of intensity 300 N/C. What is the tension in the thread if the charge on the ball is

(A) positive
(B) negative?

24. (A) Calculate the capacitance of a capacitor consisting of two parallel plates separated by a layer of paraffin wax 0.5 cm thick, the area of each plate being 80 cm². The dielectric constant for the wax is 2.0.

(B) If the capacitor is connected to a 100 V source, calculate the charge on the capacitor and the energy stored in the capacitor.

25. What law applies to self induction?

26. What is self induction?

27. How does an electric generator create electric current?

28. What is the right hand rule?

29. Sound waves are longitudinal waves. True/False

30. As the teacher talks, students hear the voice because particles of air move from the mouth of the teacher to the ear of the student. True/False

31. Sound waves are mechanical waves. True/False

32. All sound waves are produced by a vibrating object. True/False

33. A sound wave does not consist of crests and troughs. True/False

34. The speed of a sound wave depends upon the _____.

35. A meter stick (object) is placed in an upright position in front of a plane mirror as shown in the diagram at the right. The image of the meter stick is equidistant from the mirror. Suppose that the meter stick is equipped with a working eyeball capable of viewing the top and the bottom of its image. The eyeball is located at the 90-cm mark on the meter stick. Using either a ray diagram or geometry, determine …

a. … the location of the intersection of the eye's line of sight with the mirror as the eyeball sights at the top of the image.

b. … the location of the intersection of the eye's line of sight with the mirror as the eyeball sights at the bottom of the image.

c. … the amount of mirror required by the meter stick to view the image.